SPACE 2002 AND ROBOTICS 2002 CONFERENCE

Albuquerque, NM
March 17-21, 2002

Technical Program

Sunday, March 17, 2002

An Evening of Rockets! 7:00pm – 8:30pm

Albuquerque Rocketeer Jerry Cross and the Albuquerque Rocket Society present this evening devoted to large and small rockets, their history, and the activities of some of New Mexico's other rocket researchers. Rockets and motors will be on display before and after the presentation. For more information on the Albuquerque Rocket Society, please see their website at **http://www.arsabq.org/**.

Rockets, From Small Models to Large Models to Space by Jerry Cross
Longtime Space and Robotics Conference contributor Jerry Cross works by day as an Albuquerque elementary school teacher. He spends much of his spare time on amateur rocketry, both by coordinating educational activities for local children and by devoting time to the Albuquerque Rocket Society.

High-Powered Rocket Flights to 20,000 Feet by Bill Cordova
Bill Cordova, a member of the Albuquerque Rocket Society, has been a longtime experimenter in high-powered rocketry. He presents his many years of experience with attempting to squeeze a few extra feet of altitude from every rocket he designs.

Experiments and Adventures in Rocketry in the High Desert by Ray Calkins
A longtime contributor to our Conferences, Ray Calkins has been building larger and larger rockets for several years in Socorro, New Mexico. His presentation focuses on his rocket designs and the sometimes painful lessons learned along the way to reaching vacuum.

Star Party at Oak Flat 9:00pm – 11:00pm

Join the Albuquerque Astronomical Society for a late evening look at the night sky at Oak Flats in the Manzano Mountains outside Albuquerque. Many telescopes will be set up for public viewing of astronomical objects. Ticket price is $8 and covers transportation to and from the site.

Monday, March 18, 2002

Opening Plenary Session 8:00am - 9:45am

Nanotechnology: An Overview for Space Applications by Haym Benaroya, Rutgers University, Piscataway, NJ, USA

Rutgers University researcher Haym Benaroya talks about the latest research in nanotechnology for space applications.

Overview of Space Exploration by Thomas H. Prettyman, Los Alamos National Laboratory, NM, USA

Los Alamos National Laboratories researcher describes how we remotely measure the global surface composition of planetary bodies using radiation-based techniques such as gamma-ray and neutron spectroscopy. The talk will also present details about Los Alamos involvement in present and upcoming missions to the Moon, Mars, Mercury and the asteroids Vesta and Ceres.

Dr. Prettyman joined Los Alamos National Laboratory as a post-doctoral research associate in 1993. As a member of the Lunar Prospector team, he was responsible for the development of instrument response models for the gamma ray and neutron spectrometers. Dr. Prettyman has over fifty publications on instrumentation and methods for radiation detection and non-destructive assay.

Lunar Prospector: A New View of the Moon by David J. Lawrence, Los Alamos National Laboratory, NM, USA

Dr. Lawrence describes scientific results from the Lunar Prospector mission and how they have changed our perception of the Moon. These results include the discovery of water ice at the moon's poles and the mapping of a composition assymetry that has profound implications for our understanding of lunar formation and evolution.

Dr. Lawrence arrived at Los Alamos National Laboratories in 1996 and has contributed to a variety of space physics and planetary science projects. He is also Principal Investigator for projects to build space-based treaty verification sensors, to design sensors for in situ detection of water on the surface of Mars and to carry out lunar science projects using data from Lunar Prospector.

Robotics Contest 10:00am – 5:00pm

Hosted and Organized by Dr. Walter Boles, Middle Tennessee State University

Sponsored by NASA Johnson Space Center, Fluor-Daniel and Klinger Constructors

Judges: Richard Servidio, Kevin Greene, and others

Each team will have one hour to compete

Robotics I 10:00am -11:40am

Chair: Greg Starr, University of New Mexico, Albuquerque, NM, USA
Co-Chair: Jenelle Piepmeier, US Naval Academy, Annapolis, MD, USA

10:00 AM **Biclops: An Active Vision System** by K. Jonnalagadda, R. Lumia, and G.P. Starr, University of New Mexico, Albuquerque, NM

10:20 AM **Uncalibrated Vision-Based Mobile Robot Control** by J. Piepmeier, US Naval Academy, Annapolis, MD, USA and P. A. Morgan, US Navy, Corpus Christi, TX, USA

10:40 AM **Simulation-Based Grasp Planning using Neuro-Fuzzy Techniques** by K. Jonnalagadda, R. Lumina, and G.P. Starr, University of New Mexico, Albuquerque, NM, USA

11:00AM **Stabilization of Biped Locomotion Utilizing Compensation in Double-Supporting Phase**. by Kengo Toda, Aoyama Gakuin University, Aoyama, Japan; Tarayuki Furuta, Erato Kitano Symbiotic Systems, JST, Japan; and Ken Tomiyama, Aoyama Gakuin University, Aoyama, Japan

11:20 AM **Infrared Tracker Robot: Search and Rescue Operations** by Farid Fadaie, University of Tehran, Tehran, Iran; M. Nourani, University of Texas at Dallas, Dallas, TX, USA; B. Forouzande, University of Tehran, Tehran, Iran.

High-Altitude Balloons 10:00am -11:40am

*Chair***:** John Basart, Iowa State University, Ames, IA, USA
*Co-Chair***:** John Coppens**,** Catholic University at Cordoba, Argentina

10:00 AM **High Altitude Ballooning** by Paul Verhage, Treasure Valley Near Space Program, USA. *Presentation will be made by John Basart, Iowa State Univ., Ames, IA*

10:20 AM **RadioFlier - 1: An Individual Experiments in the Stratosphere via Weather Balloon** by Torrence J. Bordelon, FreeSpace, USA

10:40 AM **Low Cost Balloon Adventures in Argentina** by John Coppens, Catholic University at Cordoba, Argentina

11:00 AM **Geo-Referenced Altitude Hold for Latex Balloons** by William J. Byrd, Iowa Space Grant Consortium, Ames, IA, USA and Michael J. Cook, Spacecraft Systems & Operations Laboratory, Ames, IA, USA

11:20 AM **High altitude ballooning used to simulate Mars planetary entry** by Mark K. Caviezel, Pioneer Astronautics, Lakewood, CO, USA

Law, Business and Policy I 10:00am -11:40am

Chair: Thomas Matula, University of Houston - Victoria, Sugar Land, Texas, USA
Co-Chair: Brian Barnett, SatWest Consulting, Albuquerque, NM, USA

10:00 AM **ORBCOMM: A Business Case Analysis** by Brian M. Barnett, SatWest Consulting, Albuquerque, NM, USA

10:20 AM **FocusZenith: The New Concept in Space Business** by Laurence A. Higgs, FocusZenith, Nottingham, London, UK

10:40 AM **A Proposed Public-Private Partnership for the Funding of Robotic in-Orbit Servicers** by Alex Ellery, Kingston University, Roehampton Vale, London, UK

11:00 AM **"The Ideal Law of Government" (Space Governance)** by David Schrunk, The Quality of Laws Institute, Poway, CA, USA

11:20 AM **Market Based Approach to Commercializing the International Space Station Through the Creation of an ISS Development Corporation** by Tom Matula, University of Houston - Victoria, Sugar Land, TX, USA

Technology of Space Exploration 10:00am -11:40am

Chair: Thomas Billings, Lunar Base Research Team, The Oregon L5 Society, Inc., Oregon City, OR, USA
*Co-Chair***:** Hubert A. Allen, Jr., Sc.M. Biostatistics, Hubert Allen and Associates, Albuquerque, NM, USA

10:00 AM **Creating a Basic Sliding Armature Electric Energy-Momentum** by J.E.D. Cline, USA

10:20 AM **Mars Kites for Human Habitation** by William Byron (Joe) Poston, Personalized Software, Inc., St. Petersburg, FL, USA

10:40 AM **Failure Times in Space: A Statistician's Perspective** by Hubert A. Allen, Jr., Sc.M. Biostatistics, Hubert Allen and Associates, Albuquerque, NM, USA

11:00 AM **Gecko-Tech in Planetary Exploration and Base Operations** by Thomas Billings, R.D. McGown, C.L. York, and B. Walden, Lunar Base Research Team, The Oregon L5 Society, Inc., Oregon City, OR, USA

General Session 12:00pm - 1:00pm

Improving Access to Space by Hu Davis, Starcraft Booster, Inc., Canyon Lake, TX, USA
Saturn rocket designer Hu Davis and Astronaut Buzz Aldrin discuss various solutions to the problem of getting humanity off earth and into the ether, cheaply and permanently.

General Session 1:20pm - 3:00pm

A "Miss Manners" for Space: The Ins and Outs of the New Frontier Law
by David Livingston, Livingston Business Solutions, Tiburon, CA, USA
Space Law Specialist David Livingston, a longtime Space and Robotics Conferences contributor, discusses his Code of Ethics for Off-Earth Commerce.

Robotics II 3:20pm – 4:40pm

Chair: Dave Miller, University of Oklahoma, Norman, OK, USA
Co-Chair: Greg B. Lush, University of Texas at El Paso, El Paso, TX, USA

3:20 PM **Design and Implementation of Cooperative Mobile Robots** by Gregory Lush, University of Texas at El Paso, El Paso, TX, , USA

3:40 PM **Development of the System of Robotic Complexes for Technical Centers of Russian Ministry of Atomic Industry** by V. Volov, V. Koutcherenko, M. Malenkov, and V. Kashirin; J.S. Co. Russian Mobile Vehicle Engineering Institute, Saint Petersburg, Russia; N. Sydorkin and V. Krusanov, Russian Ministry of Atomic Industry, Moscow, Russia

4:00 PM **High-Speed Traversal of Rough Terrain Using a Rocker-Bogie Mobility System** by David Miller and Tze-Liang Lee, University of Oklahoma, Norman, OK, USA

4:20 PM **Over-Pressure and Under-Pressure Zones of Robot Wheel Contact** by Samuel Moskowitz, The Hebrew University of Jerusalem, Jerusalem, Israel

Space Power 3:20pm – 4:20pm

Chair: Darel Preble, Space Solar Power Institute, Atlanta, GA, USA
Co-Chair: S. S. Shaposhnikov, Moscow Radiotechnikal Institute, Russian Academy of Science, Moscow, Russia

3:20 PM **SASPaRiLLA** by Darel Preble, Space Solar Power Institute, Atlanta, GA, USA

3:40 PM **Wireless Power Transmission Antenna for Space Power Systems** by S.S. Shaposhnikov, Moscow Radiotechnikal Institute, Russian Academy of Science, Moscow, Russia

4:00 PM **Ten Megawatt "Proof of Concept" Solar Power Satellite** by Carlton Preble, Module 1.13 Space Solar Power Workshop, New Smyrna Beach, FL, USA

Law, Business and Policy II 3:20pm – 4:40pm

Chair: Declan O'Donnell, Declan Joseph O'Donnell, P.C., Castle Rock, CO, USA
Co-Chair: Eligar Sadeh, University of North Dakota, Grand Forks, ND, USA

3:20 PM **Space Governance** by Declan O'Donnell, Declan Joseph O'Donnell, P.C., Castle Rock, CO, USA

3:40 PM **Space and the Extraterrestrial Environment** by Sadeh, Eligar, University of North Dakota, Grand Forks, ND, USA

4:00 PM **Spaceports as Multi-Use Industrial Facilities – A Marketing** by Tom Matula, University of Houston - Victoria, Sugar Land, TX, USA

4:20 PM **The Outer Space Public Library Project** by Declan O'Donnell, Declan Joseph O'Donnell, P.C., Castle Rock, CO, USA

Lunar and Martian Exploration and Construction I 3:20pm - 5:00pm

Chair: Bryce Walden, Lunar Base Research Team, Oregon City, Oregon
Co-Chair: David Schrunk, Quality of Laws Institute, Poway, CA, USA

3:20 PM **Scenario Description of the Construction of a Lunar South Pole Infrared Telescope** by Paul van Susante, Delft University of Technology, Deflt, The Netherlands

3:40 PM **Lunar "West Pole" Prime Meridian** by Bryce Walden, Lunar Base Research Team, Oregon City, OR, USA

4:00 PM **The Moon: Optimum Location for the First Industrial/Scientific Base in Space** by David Schrunk, the Quality of Laws Institute, Poway, CA, USA

4:20 PM **Malapert Mountain Revisited** by David Schrunk, the Quality of Laws Institute, Poway, CA, USA

4:40 PM **Moon Lighting: Illumination for Lunar Base Construction and Operations** by Robert D. McGown, Thomas L. Billings, Bryce Walden, and Cheryl Lynn York. The Oregon L5 Society, Inc, Oregon City, OR, USA

Reception and Poster Sessions 6:00pm – 8:30pm

Tuesday, March 19, 2002

Plenary Session: 8:00am - 9:45am

Property Rights in Space: What is The Problem? By Declan O'Donnell, Declan Joseph O'Donnell, P.C., Castle Rock, CO, USA

Longtime Space and Robotics contributor and Space Law Specialist Declan O'Donnell discusses how property rights in space don't differ all that much from property rights situations here on Earth.

We're Going Back! Developing the World's First Commercial Lunar Lander

by Denise Norris, Applied Space Resources, USA

Applied Space Resources' Lunar Retriever I spacecraft will land in Mare Nectaris, an unexplored region of the Moon, and collect the first lunar samples for return to the Earth in over a quarter century..Denise Norris talks about details of the mission and her company.

Denise Norris is the CEO and President of Applied Space Resources. She has been a technical and management consultant to Fortune 100 financial, biotech & aviation companies for over 18 years, specializing in Information Technology.

How to Foster a Revolution by Jim Benson, SpaceDev Corporation, Poway, CA, USA

Jim Benson, President and CEO of SpaceDev Corporation, details the Ins and Outs of commercial spacecraft development.

After two years of research, Mr. Benson decided to accept the challenge of starting an entrepreneurial space commercialization venture, which combined his lifelong interests in science, technology and astronomy with his successful business experience. He started SpaceDev LLC, which was acquired by the SpaceDev Corporation in October 1997

Robotics Contest 10:00am – 5:00pm

Hosted and Organized by Dr. Walter Boles, Middle Tennessee State University, TN, USA

Sponsored by NASA Johnson Space Center, Fluor-Daniel and Klinger Constructors

Judges: Richard Servidio, Kevin Greene, and others

Each team will have one hour to compete.

Structures, Materials and Controls I 10:00am -11:20am

Chair: Narendra Khot**,** Air Force Research Laboratory, Wright Patterson AFB, OH, USA
*Co-Chair***:** Sankaran Mahadevan, Department of Civil & Environmental Engineering, Vanderbilt University, Nashville, TN, USA

10:00 AM **Probabilistic Methods for Aerospace System Conceptual Design** by Sankaran Mahadevan and Natasha Smith, University of Vanderbilt, Nashville, TN, USA

10:20 AM **Dynamic Response of a Flexible Structure with Internal Actuating System to Enhance Performance** by Narendra Khot and D.E. Veley, Air Force Research Lab, Wright Patterson AFB, OH, USA

10:40 AM **Design of Organizational Form for the Early Space Station** by Vadke Narayanan, Drexel University, Philadelphia, PA, USA, and S. Nadkarni, University of Nebraska, Lincoln, NE, USA

11:00 AM **Development and Transition of Multi-functional Structures Technologies at the Air Force Materials Research Laboratory** by Jim Guerrero, Eugene Fosness, and Buckley, Air Force Research Laboratory, Kirtland, AFB, NM, USA

Near-Earth Objects 10:00am -11:20am

Chair: A.J. Smith, International Planetary Protection Alliance (IPPA), USA
Co-Chair: hil Richter, Albuquerque, NM and Mark Boslough, Sandia National Laboratory, NM, USA

10:00 AM **Urban Search and Rescue: A Challenge for Autonomous Robots with Application to Planetary Exploration** by Dan Stormont, Utah State University, Logan, UT, USA

10:20 AM **IMPACT: An Integrated Approach for Monitoring the Threat of Earth Orbit Crossing Celestial Bodies** by L. Bussolino, R. Somma, and Alenia Spazio, Via Saccomuro, Rome, Italy

10:40 AM **Asteroid/Comet Emergency Prevention/Preparedness - Progress** by A.J. Smith, International Planetary Protection Alliance (IPPA), USA

11:00 AM **Multi-Mission Strategy for NEO** by Tom Matula, University of Houston - Victoria, Sugar Land, TX, USA

Law, Business and Policy III 10:00am -11:20am

Chair: Bryce Walden, Oregon L5 Society, Inc., Oregon City, OR, USA
Co-Chair: B.A. Ganesh, Georgia Institute of Technology, Atlanta, GA, USA

10:00 AM **Private Property in Space Resources** by Declan O'Donnell, Declan Joseph O'Donnell, P.C., Castle Rock, CO, USA

10:20 AM **Space Tourism After Dennis Tito** by David Livingston, Livingston Business Solutions, Tiburon, CA, USA

10:40 AM **Large-Scale Construction for Space-Based Economy** by B.A. Ganesh, Georgia Institute of Technology, Atlanta, GA, USA and Narayan Komerath, Georgia Institute of Technology, Atlanta, GA, USA

11:00 AM **"As long as we're here …" Secondary Profit Generators for Moon and Mars Bases** by Bryce Walden, Cheryl Lynn York, Thomas L. Billings, and Robert D. McGown; The Oregon L5 Society, Oregon City, OR, USA

Lunar and Martian Exploration and Construction II 10:00am -11:40am

Chair: Walter Boles, Middle Tennessee State University, TN, USA
Co-Chair: Judith Fielder, Consultant, Reston, VA, USA

10:00 AM **Concrete for Lunar and Mars Soils In Situ Resource Utilization** by Walter Boles, Middle Tennessee State University, Murfreesboro, TN, USA, Kim Kirby, Eastern Kentucky University, Richmond, KY, USA and Scott Baird, NASA Johnson Space Center, Houston, TX, USA

10:20 AM **In Situ Resource Utilization: Excavation to Support Other Operations** by Walter Boles, Middle Tennessee State University, Murfreesboro, TN, USA, Kim Kirby, Eastern Kentucky University, Richmond, KY, USA and Scott Baird, NASA Johnson Space Center, Houston, TX, USA

10:40 AM **Lavatube Entrance Amelioration on the Moon and Mars** by Robert D. McGown, Thomas L. Billings, Bryce Walden, and Cheryl Lynn York. The Oregon L5 Society, Inc, Oregon City, Oregon, USA

11:00 AM **Planning a Lunar Mine to Recover Hydrous Ore Deposits** by Robert M. Cox, Natural Resource Service, Inc., Bessemer, AL, USA

11:20 AM **Requirements and Opportunities for Lunar and Martian Agriculture** by Judith Fielder, Consultant, and Nickolaus Leggett, Consultant, Reston, VA, USA

General Session 12:00pm - 1:00pm

Human Factors Effects of Extended Duration Missions

Brian Peacock, National Space Biomedical Research Institute, Houston, TX, USA

Roundtable Discussion: 1:30pm - 5:30pm

Commercial Human Space Enterprises I

Organizer and Discussion Leaders: Jeri Brown and Nelson Brown

This Roundtable will address trends, progress, challenges and several other aspects of commercial human space flight.

Participants: Denise Norris, Applied Space Resources, Inc., USA
Jim Benson, SpaceDev, USA
Greg Finley, Department of Commerce, Technology Administration, USA
Thomas Matula, University of Houston –Victoria, TX, USA
Eligar Sadeh, University of North Dakota, Grand Forks, ND, USA
Hanson Scott, New Mexico Economic Development, Office of Space Commercialization, USA

Invited: Marc Schlather, ProSpace, USA
Jeff Greason, XCOR Aerospace, USA
Mike Kelly, Kelly Space & Technology, USA
Jim Ransom, Ransom Systems Engineering, USA

Wednesday, March 20, 2002

Plenary Session 8:00am - 9:45am

Exploring Space with Biomorphic Robots by Mark Tilden, Biophysics Division, Los Alamos National Laboratory, NM, USA

Certain classes of non-linear control systems have natural abilities to mimic broad ranges of biological motion and behavior when applied to appropriate mechanical robot structures. This phenomena will be addressed, displayed, and discussed with various musings on the nature of analog Nervous Net control systems, robo-morphological design, application vectoring, robobiology, scaling into image-processing applications, and how it all applies to the topic of Space Exploration.

Mark W. Tilden was educated at the University of Waterloo (Canada) in Systems Engineering. Following a Masters in media-electronics, he joined the Math Faculty at the University and spent seven years as a robotics/computer systems engineer. Following his invention of the "Living Machines" concept, he is now a research scientist at Los Alamos National Laboratory in New Mexico, furthering study and application of biomech robots for home, education, and industry. He has written several papers on the applications and theory behind his "Nervous Network" technology and a book on the International BEAM Robot Game, which he started in 1991. At present he has over three-hundred "living" robots under study in his home and office, only two of which have ever made a successful escape attempt.

Astronomy as a Tool of International Diplomacy by Alan Hale, Southwest Institute for Space Research, Alamagordo, NM, USA

Comet Hale-Bopp Co-Discoverer Alan Hale talks about how astronomy crosses the lines of nationalism to create bonds between people who didn't think they had much in common.

Alan Hale achieved worldwide recognition when Comet Hale-Bopp blazed over the skies of Earth during the early months of 1997, becoming the most widely-viewed comet in history. Although he is primarily known for his discovery of this comet, Dr. Hale is a professional scientist with a Ph.D. in astronomy and has studied, among other subjects, the threat posed by near-Earth asteroids and the detecting of planets around other stars. Dr. Hale has several books and publications to his credit, and continues to present astronomy internationally as a tool for world peace.

Distant Early Warning by Mark Boslough, Sandia National Laboratory, NM, USA

Sandia National Laboratories researcher talks about Sandia's activity in the study of asteroid and meteor impact phenomena, and how one day soon the Earth may encounter a "Dinosaur Killer."

Schoolchildren's Introduction to Space 9:30am – 11:30am

Jerry Cross, Malva Knoll and other Albuquerque educators host our biennial Schoolchildren's Introduction to Space. We'll have a live video link to NASA's Johnson Center in Houston, and (depending on availability) a possible live link to the International Space Station. Children who attend will have the opportunity to ask questions of astronauts. Other space-related activities will take place as time permits.

Structures, Materials and Controls II 10:00am -11:20am

Chair: Ramesh B. Malla, Department of Civil & Environmental Engineering, University of Connecticut, Storrs, CT, USA

Co-Chair: John Wetzel, Applied Research Associates, Inc., South Royalton, VT, USA

10:00 AM **Improvement of Positioning Accuracy in Multi-Pod Parallel Structures** by Milan Kvasnica, SPSE, Prague, Czech Republic

10:20 AM **Lightweight Solar Array Deployment Hinges Using Elastic Memory Composite (EMC)** by Karim Qassim, Air Force Research Laboratory, Kirtland AFB, NM, USA; Fred L. Beavers, Composite Technology Development, Inc, Lafayette, CO, USA; Bernie F. Carpenter and Suraj P. Rawal, Lockheed Martin Astronautics, Denver, CO, USA.

10:40 AM **Load and Deformation Characteristics of Water De-ionizing Bed For Space Applications** by Ramesh B. Malla, University of Connecticut, Storrs, CT, USA, and Jagdeesh Gopal, GM2, Inc., Glastonbury, CT, USA

Space Elevators and Tethers 10:00am -11:40am

Chair: Brad Edwards, Eureka Scientific, Berkeley, CA, USA

Co-Chair: Allen Meece, the Huntsville Alabama L5 Society, Huntsville, AL, USA

10:00 AM **The Space Elevator: Concept Overview** by Brad Edwards, Eureka Scientific, Berkeley, CA, USA

10:20 AM **A High Payload Capacity Tether System** by Aaron Smith.

10:40 AM **The Virtual Beanstalk Project** by Allen Meece, the Huntsville Alabama L5 Society, Huntsville, AL, USA

11:00 AM **The Economics of a Space Elevator** by Eric A. Westling, Houston, TX, USA

11:20 AM **The NIAC Space Elevator Program** by Brad Edwards, Eureka Scientific, Berkeley, CA, USA

Robotics in Space Exploration 10:00am - 11:20am

Chair: N. Sydorkin, Russian Ministry of Atomic Industry, Moscow, Russia

Co-Chair: Andreas von Richter, Kayser-Threde GmbH, Munich, Germany

10:00 AM **Mars Robots: Automation and Robots for Human Mars Exploration** by Andreas von Richter, Kayser-Threde, Munich, Germany

10:20 AM **Development of Autonomous Mars Rover** by V. Volov, V. Koutcherenko, M. Malenkov, and V. Kashirin; J.S. Co. Russian Mobile Vehicle Engineering Institute, Saint Petersburg, Russia; N. Sydorkin and V. Krusanov, Russian Ministry of Atomic Industry, Moscow, Russia .

10:40 AM **Experimenting with the Robotic Microobservatory at Harvard U**. by Eric Flescher, Pilot/Instructor from the Ground UP Project, Harvard University, Cambridge, MA, USA

Lunar and Martian Exploration and Construction III 10:00am -12:00pm

Chair: Howard Perko, Colorado State University, Fort Collins, CO, USA
Co-Chair: Koon Meng Chua, University of New Mexico, Albuquerque, NM, USA

10:00 AM **Martian Dust Devil Exploration Simulator** by Kimberley Kuhlman, Jet Propulsion Laboratory, Pasadena, CA, USA; Emma R. Schmidgall, Robbinsdale-Cooper High School, Golden Valley, MN, USA; and Sheri Klug, Arizona State University, Tempe, AZ, USA.

10:20 AM **Review of Martian Dust Composition, Transport, Deposition, Adhesion, and Removal** by Howard A. Perko and John D. Nelson. Ft. Collins, CO, USA

10:40 AM **Mars Global Surveyor Soil Mechanics Data Analysis** Howard A. Perko and John D. Nelson. Ft. Collins, CO, USA

11:00 AM **Analytical Modeling of Rapid Ground Penetrators** by Koon Meng Chua, University of New Mexico, Albuquerque, NM, USA and Stewart Johnson, Johnson and Associates, Albuquerque, NM, USA

11:20 AM **The Impact of Incidental Contact with Regolith in Martian and Lunar Environments** by Kim Kirby, Eastern Kentucky University, Richmond, KY, USA; Walter Boles, Middle Tennessee State University, Murfreesboro, TN, USA; and Scott Baird, NASA Johnson Space Center, Houston, TX, USA.

11:40 AM **A Need in Solar System Exploration: Sample Return Missions** by Frans Rietmeijer, University of New Mexico, Albuquerque, NM, USA

Lunch on Your Own 12:00pm – 1:20pm

General Session I: **NEO Disaster Preparedness** 1:20pm - 3:00pm

This workshop and panel session will examine the methods of threat preparation, mitigation, recovery and response available to robotics and civil engineers before, during and after a Near-Earth Object impact.

Chair: Samuel Moskowitz, The Hebrew University of Jerusalem, Jerusalem, Israel
Co-Chair: Andy Smith, International Planetary Protection Alliance (IPPA) Albuquerque, NM, USA
Presenters: Samuel Moskowitz, The Hebrew University of Jerusalem, Jerusalem, Israel
Andy Smith, International Planetary Protection Alliance (IPPA) Albuquerque, NM, USA
Alex Ellery, Kingston University, London, UK
David Miller, University of Oklahoma, Norman, OK, USA

Spacecraft and Rockets 1:20pm - 3:20pm

Chair: Eugene Fosness, Air Force Research Laboratory, Kirtland AFB, NM, USA
Co-Chair: Keith Prisbrey, University of Idaho, Moscow, ID, USA

1:20 PM **Power Systems Study for Two Variable Specific Impulse Magnetoplasma Rocket Applications** by R.E. Hebner, University of Texas at Austin, Austin, TX, USA. *Presented by Evangelos Meintanis, University of Texas at Austin, Austin, TX, USA.*

1:40 PM **Overview of Next Generation Composite Fairing Development** by John Higgins, Eugene Fosness, Peter Wegner, & Steven Buckley, Air Force Research Laboratory, Space Vehicles Directorate, Kirtland AFB, NM, USA

2:00 PM **Multiple Payload Adapter Efforts at the Air Force Research Laboratory Space Vehicles Directorate** by Eugene Fosness, John Higgins, Peter Wegner, Brandon Arritt, and Steven Buckley, Air Force Research Lab, Kirtland AFB, NM, USA

2:20 PM **Lightweight Composite Tank Development Efforts** by Brandon Arritt, Eugene Fosness, Peter Wegner, & Jim Guerrero, Air Force Research Lab, Kirtland AFB, NM, USA

2:40 PM **Intermetallic Materials for Micro Satellite Orbital Insertion** by D. Darlington, R.B. Young, and K.A Prisbrey, Univ. of Idaho, Moscow, ID, USA

3:00 PM **Future Enhanced Access to Space** by Hu Davis, Canyon Lake, TX , USA

Deployable Space Structures 3:20pm - 4:40pm

Chair: Arup Maji, Air Force Research Laboratory, VSSV, Kirtland AFB, NM, USA
Co-Chair: Tang-Tat (Percy) Ng, Air Force Research Laboratory, Kirtland AFB, NM, USA

3:20 PM **Quantification of Rigidization of Inflatable Membranes** by Patrick Montemerlo, Department of Civil Engineering, University of New Mexico, Albuquerque, NM, USA and Arup K Maji, Air Force Research Lab, VSSV, Kirtland AFB, NM, USA

3:40 PM **Edge Effect in Pressurized Membranes** by Tang-Tat Ng, Air Force Research Laboratory (VSSV), Kirtland AFB, Albuquerque, NM, USA

4:00 PM **Characterization of an Elastic Memory Composite (EMC)** by Douglas Campbell, Department of Civil Engineering, University of New Mexico, Albuquerque, NM, USA; Arup K. Maji, Airforce Research Lab, VSSV, Kirtland AFB, NM, USA; and Mark Lake, CTD Inc., USA

4:20 PM **Shape Memory Actuation of Thin Facesheets** by Arup K. Maji, Air Force Research Laboratory (VSSV), Kirtland AFB Albuquerque, NM, USA

General Session II: Disasters and Robotic Operations 3:20pm - 5:00pm

This workshop and panel session will examine the methods of threat preparation, mitigation, recovery and response available to robotics and civil engineers before, during and after a Near-Earth Object impact.

Chair:	Dan Stormont, Utah State University, Logan, UT, USA
Co-Chair:	Ken Tomiyama, Aoyama Gakuin University, Japan
Presenters:	Jenelle Piepmeier, US Naval Academy, Annapolis, MD, USA
	Nikolay Sydorkin, Russian Ministry of Atomic Industry, Robotic Center, St. Petersburg, Russia
	Gregory Lush, University of Texas at El Paso, El Paso, TX, USA
	Milan Kvasnica, SPSE, Prague, Czech Republic
	Dan Stormont, Utah State University, Logan, UT, USA

Banquet and Awards Ceremony 6:00pm – 9:00pm

The **Fluor-Daniel Trophy** will be awarded to the winning high school and university teams from the Student Robotics Competition. The Executive Committee of the Aerospace Division will present this year's **Outstanding Service Award** for the Division.

KEYNOTE - "The Haughton-Mars Project" – Pascal Lee, NASA Ames Center, USA
The NASA Haughton Mars Project (HMP) is a SETI-led international field research program centered on the scientific study of the Haughton impact crater and its surroundings, Devon Island, Nunavut, Canadian high arctic, viewed as a Mars analog. The rocky polar desert setting, geologic features and biological attributes of the site offer unique insights into the evolution of Mars, the effects of impacts on Earth, and the possibilities of life in extreme environments. The opportunity of scientific field studies at Haughton is also used to support studies in exploration research, to investigate the technologies, strategies, human factors and hardware designs relevant to the future exploration of Mars by robots and humans. Dr. Lee will provide details and lessons learned as he talks about the difficulties of simulating another planet here on Earth.

Pascal Lee was born in Hong Kong in 1964, grew up in France, and came to the United States in 1989. He holds an Ingénieur degree (ME) in Engineering Geology and Geophysics from the University of Paris (1987), a MS in Astronomy and Space Sciences from Cornell University (1993) and a Ph.D. in Astronomy and Space Sciences from Cornell (1997). Lee's research interests focus on Mars, asteroids and impact craters. He is particularly interested in the geologic history of Mars, the history of water on that planet, and the geologic and physical conditions allowing life to arise and evolve on planets. He often visits the Earth's polar regions and deserts for Mars analog studies. In 1988 he wintered over in Antarctica for 14 months at Dumont d'Urville Station as station geophysicist. In 1995-96 he was a field team member on the US Antarctic Search for Meteorites (ANSMET) Program. In 1998 and 1999 he was field scientist for the NASA / Carnegie Mellon University Robotic Antarctic Search for Meteorites (RAMS) Project. In 1997, while a National Research Council postdoctoral Research Associate at NASA Ames Research Center, Pascal Lee initiated the NASA Haughton-Mars Project, an international multidisciplinary field research program focused on the Haughton impact crater site and surroundings, Devon Island, Nunavut, Arctic Canada, viewed as a Mars analog. The HMP investigates possible parallels between the Earth and Mars, in particular in geology and astrobiology, and conducts field studies of the technologies, hardware designs, strategies and human factors relevant to the future exploration of Mars by robots and humans. Pascal Lee has led all HMP expeditions to date. HMP-2000 is the fourth field season of the HMP.

Lee is also a founding member of the Mars Society, an international non-profit private organization in support of the human exploration of Mars. He serves as Project Scientist for the Mars Society's "Flashline" Mars Arctic Research Station (F.M.A.R.S.) Project, a field research laboratory and simulated Mars habitat to be established at Haughton Crater on Devon Island in July, 2000. The F.M.A.R.S. will enhance the ongoing Mars analog field research at Haughton and help further studies of surface operations and exploration activities on a human mission to Mars. Pascal enjoys flying and photography. He is a FAA-certified helicopter flight instructor and lives happily in San Jose, CA.

Thursday, March 21, 2002

International Session

8:00am - 10:00am

Sponsored by ASCE and IEEE, and Co-Sponsored by International Academy of Astronautics (IAA), Paris, France, American Astronautical Society (AAS), Vienna, VA, and International Science and Technology Center (ISTC), Moscow, Russia

Session Co-Chairs: George W. Morgenthaler, University of Colorado at Boulder, CO, USA and John Mankins, NASA Headquarters, Washington, DC, USA
Session Secretary: Gordon R. Woodcock, Consultant to Gray Research, Huntsville, AL, USA

8:00 AM **The Paths Ahead: All Roads Lead to Mars** by George W. Morgenthaler, University of Colorado at Boulder, Boulder, CO, USA

8:20 AM **A Modern Reusable Human Interplanetary Space Transportation System** by Gordon R. Woodcock, Consultant to Gray Research, Huntsville, AL, USA

8:40 AM **Human Aspects of Interplanetary Space Flight: From Apollo into the New Millennium** by Bonnie Dunbar, NASA Astronaut, Houston, TX, USA.

9:00 AM **Visualization as a New Tool for Planning and Design of Interplanetary Space Exploration Missions** by Scott Curtis, Lockheed Martin Astronautics, Denver, CO, USA

9:20 AM **The International Science and Technology Center (ISTC) Program and the Opportunity it Represents** by Lev Techeny, The ISTC Office, Moscow, Russia.

9:40 AM **Current ISTC Projects on Human Exploration of Space** by Marton Forkosh, NASA Glenn Research Center, Cleveland, OH, USA

The Great Debate

10:20am - 12:30pm

Hosted by Darel Preble, Space Solar Power Institute, Atlanta, GA, USA

The Great Debate series focuses on important longstanding issues of space exploration. Each team is composed of well-qualified experts who hold strong feelings on the topic. The results are always educational and never boring.

The Hearty Members of the "Moon Team":
Bill Agosto, Space Modules, Inc.
Greg Bennett, Artemis Society International
Bernard Foing, European Space Agency

The Vigorous Members of the "Asteroids Team":
Mark Sonter, University of Woolagong, Australia
Steven Ostro, NASA Jet Propulsion Laboratories
Grant Stokes, Massachusetts Institute of Technology, Boston, MA, USA
Andy Smith, International Planetary Protection Alliance (IPPA), Albuquerque, NM, USA

This year's Great Debate teams will debate the following topic:
"Resolved, the most economically attractive case for in-situ resource development is (a) The Moon or (b) the (listed) Near Earth Object Asteroids:

1. (20 min.) 1st NEO Constructive:
2. (5 min.) Cross X by Moon Team
3. (20 min) 1st Moon Constructive:
4. (5 min.) Cross X by NEO Team
5. (20 min.) 2nd NEO Constructve
6. (5 min.) Cross X by Moon
7. (20 min) 2nd Moon Constructive
8. (5 min.) Cross X by NEO
9. (30 min.) Questions from the audience
10. (15 min.) Summary and closing from NEO
11. (15 min.) Summary and closing from Moon